

# Linux System Administration

## Presentation

**Objectives:** Learn Basic System Administration on Linux.

**Delivery mechanism: Classroom Training**

**Who can benefit:** Windows™, Mac and Unix users/administrators.

**Prerequisites:** Computer literacy.

**Learning technique:** Clear, theoretical course content divided into lessons and extensive LABS both available on-line 24/24 7/7 and downloadable in PDF format.

**Student Progression:** Student progression is monitored both in terms of effective course duration and in terms of student comprehension using self-assessment tests.

**Operating Systems covered by this course:** CentOS/Redhat, Debian, openSUSE.

**Duration:** 35 hours over 5 days.

## Contents

- **Managing Users and Groups**

- Groups
- Users
- Commands
  - Groups
    - groupadd
      - Command Line Switches
    - groupdel
      - Command Line Switches
    - groupmod
      - Command Line Switches
    - newgrp

- Command Line Switches
- gpasswd
  - Command Line Switches
- Users
  - useradd
    - Command Line Switches
  - userdel
    - Command Line Switches
  - usermod
    - Command Line Switches
  - passwd
    - Command Line Switches
- Configuration
- LAB #1 - Managing Groups and Users
- su et su -
- sudo
- **Commands** : grpck, grpconv, grpunconv, pwck, pwconv, pwunconv, groupadd, groupdel, groupmod, newgrp, gpasswd, useradd, userdel, usermod, passwd, id, groups, su, sudo.

- **Package Management**

- Compiling Software the Old Way
  - ./configure
  - make
  - make check
  - make install
- The rpm Command with Red Hat and OpenSUSE
- Yellow Dog Updater Modified and Red Hat
  - Configuration
  - Repositories
  - Usage
  - LAB #1 - Working with Yum
- Zypper and OpenSUSE
  - Configuration
  - Repositories

- Usage
- LAB #2 - Working with Zypper
- The dpkg Command
- Advanced Package Tool and Debian
  - Configuration
  - Repositories
  - Usage
  - LAB #1 - Working with Apt
- Shared Libraries
  - Presentation
    - Introduction
    - Shared Object Locations
    - ld-linux.so.2
    - The ldd Command
    - The /etc/ld.so.conf File
    - The ldconfig Command
- **Commands** : rpm, yum, dpkg, apt-get, apt-cache, zypper, mc, wget, configure, make, ldd, ldconfig.

## • Managing File Permissions

- Preparation
- Basic Unix File Permissions
  - Changing Permissions with chmod
    - Symbolic Mode
    - Octal Mode
    - Command Line Switches
- The umask command
  - Command Line Switches
- Changing the Owner or the Group with chown and chgrp
  - Command Line Switches
- Advanced Unix Permissions
  - SUID/SGID bit
  - Inheritance Flag
  - Sticky bit
- ACLs

- Command Line Switches
- Ext2/Ext3/Ext4 Attributes
- **Commands** : chmod, umask, chown, chgrp, setfacl, getfacl, chattr, lsattr.

- **Managing Disks and Swap Space**

- Block Devices
- Partitions
  - Master Boot Record
  - Apple Partition Map
  - GUID Partition Table
- Partitioning
  - LAB #1 - Using fdisk
- Journaled Filesystems
  - Presentation
  - Ext3
  - Ext4
  - ReiserFS
  - XFS
  - JFS
- Swap Space
  - Swap Size
  - Swap Partitions
  - The swapon Command
    - Command Line Switches
  - The swapoff Command
    - Command Line Switches
- The /etc/fstab file
- Swap Files
- **Commands** : fdisk, mke2fs, tune2fs, dumpe2fs, mkfs.xfs, xfs\_info, xfs\_admin, mkfs.reiserfs, debugreiserfs, reiserfstune, mkfs.jfs, jfs\_tune, mkswap, swapon, swapoff.

- **Process Scheduling**

- cron
- anacron
- at

- **Commands** : cron, anacron, at.

- **Archiving and Compression**

- Archiving
  - tar
    - Presentation
    - Command Line Switches
    - LAB #1 - Exercises
  - cpio
    - Presentation
    - Command Line Switches
    - LAB #2 - Exercises
  - dd
    - Presentation
    - Command Line Switches
    - LAB #3 - Exercises
  - dump and restore
    - Presentation
- Compression
  - gzip
    - Presentation
    - Command Line Switches
    - LAB #4 - Exercises
  - bzip2
    - Presentation
    - Command Line Switches
    - LAB #5 - Exercises
  - Other Tools
- **Commands** : tar, cpio, dd, dump, restore, gzip, gunzip, bzip2, bunzip2, xz, compress, uncompress, rar, unrar, zip, unzip.

- **Process Management**

- Process Types
- Process Commands
  - The ps Command
    - Command Line Switches

- The pstree Command
  - Command Line Switches
- The top Command
- The fg and bg Commands
  - Command Line Switches
- The wait Command
- The nice Command
  - Command Line Switches
- The renice Command
  - Command Line Switches
- The nohup Command
  - Command Line Switches
- The kill Command
- **Commands** : ps, pstree, top, fg, bg, wait, nice, renice, nohup, kill.

- **Managing Logs**

- The /var/log/messages file
- The /bin/dmesg Command
- The /var/log/audit/audit.log file
  - Managing Audit Events
    - auditd
    - auditctl
      - Command Line Switches
    - audispd
  - Viewing Audit Events
    - The aureport Command
      - Command Line Switches
    - The ausearch Command
      - Command Line Switches
- Applications
- rsyslog
  - Priorities
  - Facilities
  - /etc/rsyslog.conf

- Modules
- Global Directives
- Rules
  - Facility.Priority
  - Facility!Priority
  - Facility=Priority
  - Using the \* Wildcard
  - n Facilities with Identical Priorities
  - n Selectors with Identical Actions
- /usr/bin/logger
  - Command Line Switches
- **Commands** : dmesg, auditd, auditctl, audoispsd, aureport, ausearch, rsyslog, logger, logrotate.

## • Printer Management

- Introduction
  - Protocols
  - Daemon
- Configuration
  - /etc/cups/cupsd.conf
  - Filters
  - Backends
  - Logs
  - Printers
- Administration
  - The lpstat Command
  - The lpadmin Command
  - The accept and cupsenable Commands
  - Setting Up the Default Printer
  - Using a .ppd File to Add a Printer
  - Classes
  - The /etc/cups/printers.conf File
  - The /etc/cups/classes.conf File
  - The cancel Command
  - The lpmove Command

- Destroying a Class
- Web Interface
- Graphical Interface
- **Commands** : lpadmin, accept, reject, cupsenable, cupsdisable, lpstat, cancel, lpmove, lpinfo, lppasswd, lp.

- **System Startup and Shutdown**

- System Startup
  - Boot Loader
    - BIOS Systems
    - EFI Systems
- GRUB
  - GRUB LEGACY on Red Hat/CentOS
  - GRUB LEGACY on OpenSUSE
  - GRUB 2 on Debian Squeeze
    - The /boot/grub/device.map file
    - The /etc/default/grub file
    - Files in the /etc/grub.d directory
- Initramfs
  - Initramfs on Redhat / CentOS
    - The init Script
    - The dracut Command
  - Initramfs on Debian Squeeze
    - The init Script
    - The mkinitramfs Command
  - Initramfs on openSUSE
    - The init Script
    - The mkinitrd Command
- Kernel Booting Process
- The Init Process
- RUNLEVELS
- Unix System V Startup Scripts
  - Debian Squeeze
    - Inittab
    - The /etc/init.d directory



- Le script rc.S
- The /etc/rcX.d Directories
- The update-rc.d Command
- The chkconfig Command
- openSUSE
- Upstart Startup Scripts
  - Red Hat/CentOS 6
    - System Initialisation
    - Runlevels
    - [CTL]-[ALT]-[DEL]
    - mingetty
    - rc.sysinit
    - The /etc/rc.d/init.d Directory
    - The /etc/rc.d/rcX.d Directories
    - La commande chkconfig
- System Shutdown
  - The shutdown Command
  - The reboot command
  - The halt Command
  - The poweroff Command
- **Commands** : grub\_install, runlevel, init, telinit, chkconfig, update-rc.d, dracut, mkinitramfs, mkinitrd, shutdown, halt, reboot, poweroff.

## • Managing Integrated Peripherals

- Special Files
- Commands
  - The lspci Command
    - Command Line Switches
  - The lsusb Command
    - Command Line Switches
  - The dmidecode Command
    - Command Line Switches
- The /proc Directory
  - Sub-directories
    - ide/scsi

- acpi
- bus
- net
- sys
- The systemctl Command
  - Command Line Switches
- Files
  - /proc/cpuinfo
  - /proc/interrupts
  - /proc/dma
  - /proc/ioports
  - /proc/devices
  - /proc/modules
  - /proc/diskstats
  - /proc/partitions
  - /proc/swaps
  - /proc/loadavg
  - /proc/meminfo
  - /proc/version
- Interpreting Information in /proc
  - Commands
    - free
    - uptime or w
    - iostat
    - vmstat
    - mpstat
    - sar
  - Production Environments
    - Identifying a System with a CPU Bottleneck
    - Identifying a Memory Problem
    - Identifying I/O Bottlenecks
- USB Modules
- udev
  - The udevadm Command

- Command Line Switches
  - The /sys Filesystem
  - Limiting Resources
  - **Commands:** lspci, lsusb, dmidecode, free, uptime, w, iostat, vmstat, mpstat, sar, udevadm.
- **Managing a TCPv4 Network**
  - Communication models
    - OSI
      - NDIS and ODI
    - TCP/IP
      - Messages, Datagrams and Segments
      - Establishing a TCP connection
      - The TCP header
      - The UDP header
      - Fragmentation and Re-encapsulation
      - TCPv4 Classes
      - Subnet Masks
        - Variable Length Subnet Masks - VLSM
      - Ports and sockets
  - Configuring a Network Client under Linux
    - /etc/services
    - Ethernet address resolution with arp
      - Command Line Switches
  - Configuring TCP/IP v4
    - Red Hat
      - DHCP
        - /etc/sysconfig/network
        - /etc/sysconfig/network-scripts/ifcfg-ethX (où X=0,1 ...)
      - Fixed IP Address
        - /etc/sysconfig/network
        - /etc/sysconfig/network-scripts/ifcfg-ethX (où X=0,1 ...)
    - Debian
      - DHCP
        - /etc/network/interfaces

- Fixed IP Address
  - /etc/network/interfaces
- openSUSE
  - DHCP
    - /etc/sysconfig/network/config
    - /etc/sysconfig/network/dhcp
    - /etc/sysconfig/network/ifcfg-ethX (où X=0,1 ...)
  - Fixed IP Address
    - /etc/sysconfig/network/ifcfg-ethX (où X=0,1 ...)
- The /etc/networks file
- IP address resolution
  - /etc/resolv.conf
  - /etc/nsswitch.conf
  - /etc/hosts
- Network Services
  - xinetd
  - TCP Wrapper
- Basic Networking Commands
  - hostname
    - Command Line Switches
  - ifconfig
    - Command Line Switches
  - ping
    - Command Line Switches
  - netstat -i
    - Command Line Switches
- Static Routing Tables
  - The route Command
    - Command Line Switches
  - The netstat Command
    - Command Line Switches
  - The traceroute Command
    - Command Line Switches
- Turning routing ON/OFF

- Manually bringing up and down a network interface
- Remote Administration
  - Telnet
    - Command Line Switches
  - ssh
    - Command Line Switches
  - wget
    - Command Line Switches
  - ftp
    - Command Line Switches
  - scp
    - Command Line Switches
- **Commands:** netstat, arp, nslookup, dig, ifconfig, ifup, ifdown, ifstatus, NetworkManager, hostname, uname, ping, tcpd, xinetd, route, traceroute, telnet, ssh, wget, ftp, scp.

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